

PRELIMINARY OPEN-FILE REPORT SUBJECT TO REVISION

Stratigraphic description of DOE/EGSP

Core 41 (W.V. 5)

Point Pleasant, WV

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- 2660' - 2674.2' 2660'-2668' - Unrecoverable rubble
2668'-2674.2' - Shale (5Y 2/1) olive black containing silty dolomitic (N-5) laminations and streaks; 2670.4' to 2670.5' interbedded N-5 silt and shale, rippled and micro crossbedded, amber Tasmanites disseminules are prolific in the darker (5Y 2/1) zones, while pyritized spores, pyritized worm burrows, and carbonaceous fragments occur in the lighter (N-5) grey shales. Several disc fractures throughout the interval make it quite impossible to orient.
- 2674.2' - 2682.2' Shale (5Y 2/1) olive black with thin beds, laminations, and streaks of (5Y 4/1) olive grey shale. At 2680.5' a facies change occurs from predominantly olive black shale to olive grey shale with thin beds of 5Y 2/1 shale. Framboidal pyrite and pyritized spores occur in the olive grey shale, while amber spores and numerous carbonaceous fragments characterize the darker (5Y 2/1) shales. A thin bed (0.03') of (5Y 2/1) olive black shale occurs at 2681.6' displaying pyritized worm burrows at the upper interface with the (5Y 4/1) olive grey shale. Pyrite streaks occur occasionally throughout the interval.
- Unoriented due to numerous disc fractures.
- 2682.2' - 2690.2' Shale (5Y 4/1) olive grey with laminations and thin beds of 5Y 2/1 olive black shale. Silty laminations and streaks occur throughout the interval. Pyritized spores, pyritized worm burrows, framboidal pyrite, and carbonaceous fragments are abundant. Numerous disc fractures make this interval unorientable.
- 2690.2' - 2698.0' Shale (5Y 4/1) olive grey with thin beds and laminations of (5Y 2/1) olive black shale. Several zones containing laminations and streaks of (N-5) silty shale occur throughout the interval which becomes progressively more silty beginning at 2694.5'. Framboidal pyrite, pyritized spores, pyritized worm burrows, and carbonaceous fragments occur throughout the interval. This friable shale contains many disc fractures making it impossible to orient.
- 2690.8' - 2705.5' Shale (5Y 4/1) olive grey with thin beds and laminations of (5Y 2/1) olive black shale. Silty (N-5) streaks occur throughout the interval. Silty laminations at 2703.2' and 2703.9' exhibit loading and microcrossbedding features. Framboidal pyrite, pyritized spores, and carbonaceous fragments occur throughout. Flute casts at 2694.2' indicate paleocurrent direction. This interval is very friable with numerous bedding plane fractures occurring due to unloading.
- 2705.5' - 2713.5' Shale (5Y 4/1) olive grey with (5Y 2/1) olive black laminations throughout. Beginning at approximately 2710', (5YR 2/1) brownish black laminations and beds begin to dominate rather than the (5Y 2/1) olive black facies. Several silty (N-5) dolomitic streaks occur throughout. Framboidal pyrite, pyritized spores, pyritized worm burrows, and carbonaceous fragments are numerous throughout the interval. Flute casts at 2709.8' indicate paleocurrent direction. A pyritized brachiopod occurs at 2710.5'. While appearing to be a Lingule it does not display bilateral symmetry (due to distortion). The entire interval is highly friable, thus numerous bedding plane fractures occur.
- 2713.5' - 2721.3' Shale (5Y 4/1) olive grey with (5YR 2/1) brownish black laminations and thin beds. A facies change occurs at 2720.15' where the brownish black shale becomes dominant. Several silty (N-5) streaks and laminations occur throughout the interval. Loading and burrowing features are associated with these silty laminations.

Framboidal pyrite and carbonaceous fragments occur throughout. The size and frequency of occurrence of carbonaceous material increases in the (5YR 2/1) brownish black facies. The (5Y 4/1) olive grey shale is very friable and numerous bedding plane fractures are present.

- 2721.3' - 2729.1' Shale (5YR 2/1) brownish black with silty dolomitic (N-5) streaks and laminations which exhibit loading and microcrossbedding features. These features begin at 2726.2' and occur occasionally throughout the remaining portion of the interval. Pyritic nodules are common and occur throughout the entire interval. Several conodont fragments can be found along with several unidentifiable fossils and large carbonaceous fragments. The interval is high in organics and fossil content.
- 2729.1' - 2736.9' Shale (5YR 2/1) brownish black with a facies of (5Y 4/1) olive grey shale laminated with (5Y 2/1) olive black shale. This olive shale facies extends from 2729.8' to 2733.8'. This facies is high in euhedral pyrite and small carbonaceous fragments. Several large pieces of carbonaceous material occur in the brownish black shale. Also several unidentifiable fossils are located in this facies.
- 2736.9' - 2744.9' Shale (5YR 2/1) brownish black with (5Y 4/1) olive grey laminations. At 2741.8' a facies change to (5Y 4/1) olive grey shale occurs with thin beds and laminations of (5YR 2/1) brownish black shale and (5Y 2/1) olive black shale. Several pyrite nodules occur in the brownish black shale facies. Several conodonts including a platform type, conodonts with long, thin, and common blade-like may be observed at 2736.9'. Carbonaceous fragments occur throughout the interval. Unidentified fossils occur at 2737.8' and 2739.6'. Several plant stems occur at 2741.7'. In passing from the (5YR 2/1) facies to the (5Y 4/1) facies, a significant decrease in grain size can be noted along with an increase in occurrence of pyritized spores and pyritized worm burrows.
- 2744.9' - 2750.9' Shale (5Y 4/1) olive grey interbedded with (5Y 2/1) olive black shale. A thin bed of olive grey silt occurs at 2749.6'. Small fragments of carbonaceous material, some pyritized spores, and pyritized worm burrows occur throughout the interval. Several coring induced fractures are present.
- 2750.9' - 2759.4' Shale (5Y 4/1) olive grey with thin beds and laminations of (5Y 2/1) olive black shale and (N-5) silty shale. Pyritized plant fragments, carbonaceous fragments, pyritized spores, and pyritized worm burrows occur throughout the interval.
- 2759.4' - 2766.2' Shale (5Y 2/1) olive black with (5Y 4/1) olive grey thin beds, laminations and streaks. Several pyritized worm burrows, conodonts, plant fragments, spores (amber and pyritized) occur throughout the interval.
- 2766.2' - 2773.4' Shale (5Y 2/1) olive black interbedded with (5Y 4/1) olive grey shale. A facies change occurs at 2768.7' where the olive grey shales become dominant with thin beds & laminations of olive black shale. An interval from 2768.7' to 2770.1' of (5Y 4/1) olive grey shale is rippled & streaked with (5Y 2/1) olive black shale. Amber spores & carbonaceous material occur in the olive black facies while pyritized spores occur in the lighter olive grey shale. Pyrite nodules, pyritized worm burrows, framboidal pyrite & carbonaceous material occur throughout the interval.
- 2773.4' - 2781.2' Shale (5Y 4/1) olive grey with thin beds, laminations, and streaks of (5Y 2/1) olive black shale. An olive grey silty dolomitic zone (2777.65' to 2777.85') exhibits loading & microcrossbedding features. Several

pyritized bioturbated zones are associated with the (5Y 2/1) olive black laminations from 2774.0' to 2774.8'. Pyritized spores, framboidal pyrite, and carbonaceous material occur throughout the interval.

2781.2' - 2789.2' Shale (5Y 4/1) olive grey with (5GY 6/1) greenish grey silty dolomitic beds, laminations, & streaks. An occasional (5Y 2/1) olive black lamination occurs. Framboidal pyrite, pyritized spores, & carbonaceous fragments occur throughout. A silty dolomitic beds from 2781.2' to 2782.1' displays microcrossbedding & burrowing features.

2789.2' - 2796.4' Shale (5Y 4/1) olive grey with thin beds, laminations, and streaks of silty (5GY 6/1) greenish grey shale & (5Y 2/1) olive black shale. Burrowing, loading, and microcrossbedding features are associated with the thin silty beds. Pyritized & carbonaceous plant fragments, pyritized spores, and pyritized burrows occur throughout the interval.

2796.4' - 2804.1' Shale (5Y 4/1) olive grey interbedded, laminated, & streaked with (5GY 6/1) greenish grey silty shale & (5Y 2/1) olive black shale. Pyrite streaks, ripples, & feathered bedding occur in the (5Y 4/1) olive grey shale. Burrowing & loading features are associated with the silty shale facies. Pyritized burrows, pyritized spores, pyritized plant fragments, carbonaceous fragments, and framboidal pyrite occur throughout the interval.

2804.1' - 2809.9' Shale (5Y 4/1) olive grey with thin beds, laminations, & streaks of (5GY 6/1) greenish grey silty shale and (5Y 2/1) olive black shale. Loading, burrowing, and microcrossbedding features are associated with the silty shale facies. Carbonaceous and pyritized plant fragments, pyritized spores, pyritized burrows, & framboidal pyrite occur throughout the interval.

2809.9' - 2817.4' Shale (5Y 4/1) olive grey with thin beds & laminations of (5YR 2/1) brownish black shale & (5Y 2/1) olive black shale. Bioturbated zones occur at 2811.0', 2814.8', and 2817.0'. From stains occur in a silty zone from 2813.4' to 2813.7'. Pyritized spores, pyritized burrows, pyritized & carbonaceous plant fragments, & framboidal pyrite occur throughout the interval.

2817.4' - 2823.3' Shale (5Y 4/1) olive grey with thin beds of (5Y 2/1) olive black shale. A silty facies occurs from 2820.4' to 2822.0'. A dolomitic bioturbated lamination occurs at the top of the silty facies while a thin lamination of black shale containing pyritized burrows occurs at the base of the facies. Other dolomitic bioturbated zones occur at 2821.0' & 2822.8'. Several dolomitic & pyritic streaks occur in the lower 3.5' of the interval. The interval contains pyritized worm burrows, pyritized plant fragments, pyritized spores, carbonaceous fragments, & brachiopod fragments.

2823.3' - 2830.9' Shale (5Y 4/1) olive grey with (5GY 6/1) greenish grey silty dolomitic laminations & streaks. Two thin beds of (5YR 2/1) brownish black shale occur from 2828.6' to 2828.9' and from 2830.5' to 2830.9'. A silty facies occurs from 2829.7' to 2830.5'. Several pyritized plant stems and pyritized burrows occur throughout the interval.

2830.9' - 2838.0' Shale (5YR 2/1) brownish black interbedded & laminated with (5Y 4/1) olive grey shale. A silty (5GY 6/1) greenish grey zone at 2837.' displays microcrossbedding & loading features. Pyritized spores occur in the olive grey shale while amber spores are common in the brownish black shale. Carbonaceous & pyritized plant fragments occur throughout the interval.

- 2838.0' - 2845.5' Shale (5YR 2/1) brownish black interbedded with (5Y 4/1) olive grey shale. A silty facies from 2844.25' to 2844.45' displays microcrossbedding features. This thin bed contains pyritized burrows at the lower contact with the brownish black shale. Large carbonaceous plant fragments and amber spores are common in the brownish black facies while the olive grey facies exhibits pyritized burrows and small pyritized plant fragments.
- 2845.5' - 2853.35' Shale (5YR 2/1) brownish black interbedded and laminated with (5Y 4/1) olive grey shale. Bioturbation features are displayed at the interface between the grey and black shales. Pyritized burrows, pyritized and amber spores, and carbonaceous fragments occur throughout the interval.
- 2853.35' - 2860.6' Shale (5Y 4/1) olive grey with thin beds & laminations of (5YR 2/1) brownish black shale. Pyrite streaks, pyritized burrows, and an occasional silty dolomitic lamination are associated with the olive grey shale. Pyritized spores and carbonaceous fragments occur throughout the interval.
- 2860.6' - 2868.0' Shale (5Y 4/1) olive grey interbedded with (5YR 2/1) brownish black shale. An occasional silty dolomitic lamination occurs. Pyritized and amber spores, and carbonaceous and pyritized plant fragments occur throughout the interval.
- 2868.0' - 2874.0' Shale (5Y 4/1) olive grey interbedded and laminated with (5YR 2/1) brownish black shale. Pyritized and amber spores occur throughout the interval along with numerous carbonaceous fragments.
- 2874.0' - 2881.7' Shale (5Y 4/1) olive grey interbedded and laminated with (5YR 2/1) brownish black shale. Several silty dolomitic laminations occur throughout. Bioturbated zones occur from 2878.7' to 2879.2'. Several pyritized burrows occur throughout the interval. Pyritized spores, plant fragments, and framboidal pyrite are common.
- 2881.7' - 2889.2' Shale (5YR 2/1) brownish black interbedded with (5Y 4/1) olive grey shale. Silty laminations and streaks occur throughout most of the interval. Intersecting natural microfractures occur at 2886.9'. Pyritized and amber spores, carbonaceous plant fragments, and framboidal pyrite occur throughout.
- 2889.7' - 2897.2' Shale (5Y 4/1) olive grey interbedded and laminated with (5YR 2/1) brownish black shale. Several silty laminations exhibit microcrossbedding features. Several of these laminations are dolomitic. Framboidal pyrite, pyritized and amber spores, and worm burrows occur throughout the interval.
- 2897.2' - 2905.3' Shale (5Y 4/1) olive grey interbedded and laminated with (5YR 2/1) brownish black shale. Several (5GY 6/1) greenish grey silty dolomitic laminations, streaks, and thin beds occur. Burrowing features occur at the base of most of these silty zones. Pyritized and amber spores and framboidal pyrite occur throughout the interval. Carbonaceous material in the form of vitrain covers the entire bedding surface at 2905.'. A natural vertical fracture begins at 2904.'
- 2905.3' - 2912.7' Shale (5YR 2/1) brownish black with laminations and thin beds of (5Y 4/1) olive grey shale. The interval is high in organics with amber spores being prolific throughout. Carbonaceous fragments and pyritized spores can be observed occasionally. A fish scale can be seen at 2912.7'. A natural vertical fracture extends from the top of the interval to 2912.1'.
- 2912.7' - 2920.5' Shale (5YR 2/1) brownish black interbedded with (5Y 4/1) olive grey shale. Amber spores are prolific throughout the brownish black facies while pyritized spores occur in the olive grey facies. Several unidentified fossils occur in the brownish black shale. Pyritized burrows occur at 2919.9'.

- 2920.5' - 2929.8' Shale (5Y 4/1) olive grey interbedded and laminated with (5YR 2/1) brownish black shale. The olive facies changes to the brownish black facies at approximately 2927.8'. Pyritized and amber spores, carbonaceous fragments, & pyritized burrows can be observed throughout the interval. A conodont can be observed upon the bedding surface at 2928.1'.
- 2929.8' - 2937.7' Shale (5YR 2/1) brownish black with thin beds and laminations of (5Y 4/1) olive grey shale. The interval is prolific in amber spores and carbonaceous material. Pyrite nodules and lenses occur occasionally.
- 2937.6' - 2945.6' Shale (5YR 2/1) brownish black streaked, laminated, & interbedded with (5Y 4/1) olive grey shale. A silty dolomitic layer occurs at 2937.8' displaying microcrossbedding features. An occasional pyrite nodule occurs. A natural inclined fracture extends from 2938.7' to 2914.4. Amber spores are prolific throughout the interval, while an occasional fish scale may be encountered. Carbonaceous fragments are also abundant in the interval.
- 2945.6' - 2953.5' Shale (5YR 2/1) brownish black streaked, laminated, & interbedded with (5Y 4/1) olive grey shale. Several bioturbated zones occur at the interface between the olive grey shale and the brownish black shale. An occasional pyritized burrow can be observed in the dark shale. Amber spores and carbonaceous fragments occur throughout the interval.
- 2953.5' - 2961.5' Shale (5YR 2/1) brownish black interbedded with (5Y 4/1) olive grey shale. Bioturbation features can be observed at the interface between the grey shale & black shale. The interval is high in organics with amber spores being prolific throughout the entire interval. Large fragments of carbonaceous material along with numerous small fragments can be found. Several unidentified fossils also occur. Several pyritized burrows occur throughout the interval.
- 2961.5' - 2969.5' Shale (5YR 2/1) brownish black with streaks and thin beds of (5Y 4/1) olive grey shale. Bioturbation features are common at the interface between the grey & black shales. Amber spores are prolific throughout the interval. Fish scales also are abundant along in the carbonaceous fragments. What might be a scaleodont appears at 2967.1'.
- 2969.7' - 2977.5' Shale (5YR 2/1) brownish black streaked and laminated with (5Y 4/1) olive grey shale. Bioturbation features are associated with these laminations. Several unidentified fossils occur throughout the interval. Fish scales and amber spores are abundant throughout the interval.
- 2977.5' - 2983.4' Shale (5YR 2/1) brownish black with streaks, laminations, and thin beds of (5Y 4/1) olive grey shale. Microcrossbedding & burrowing features are associated with this light grey facies. The interval is high in organics, with amber spores, fish scales, & carbonaceous material being abundant. The brachiopod Lingula occurs at 2979.2' and 2979.3'.
- 2983.4' - 2990.9' Shale (5Y 4/1) olive grey interbedded & streaked with (5YR 2/1) brownish black shale. Some bioturbation is present at the interface between the olive grey shales & the brownish black shales. Lingula was observed at 2988.5'. Several pyritized worm burrows can be seen in the olive grey facies associated with pyritized spores.

- 2990.9' - 2999.0' Shale (5YR 2/1) brownish black interbedded, laminated, & streaked with (5Y 4/1) olive grey shale. A vertical extends from 2994.4' to 2996.6'. The interval contains amber & pyritized spores, carbonaceous fragments, and pyritized burrows. A highly carbonaceous zone with vitrain like material shows shrinkage cracks with dolomit filling.
- 2999.0' - 3005.3' Shale (5YR 2/1) brownish black interbedded with (5Y 4/1) olive grey shale. Microcrossbedding and bioturbation features are associated with these olive grey shales. Some pyritized burrows occur at 3002.3'. Two Lingula can be observed at 3002.2'. Amber spores, carbonaceous material, & pyritized burrows are abundant throughout the interval. Pyritized spores and burrows are common in the olive grey facies.
- 3005.3' - 3013.2' Shale (5YR 2/1) brownish black interbedded, laminated, & streaked with (5Y 4/1) olive grey shale. The core contains bioturbation features, framboidal pyrite, & carbonaceous and amber spores.
- 3013.2' - 3020.9' Shale, brownish black (5YR 2/1) to olive black (5Y 2/1) interbedded, laminated, and streaked with olive grey (5Y 4/1) shale. The interval contains framboidal pyrite, some bioturbation with pyritized burrows, and pyritized streaks. Amber spores are found in the brownish black sections. Fish scales occur in some of the darker shale portions.
- 3020.9' - 3028.6' Shale (5YR 2/1) brownish black interbedded and laminated with olive grey (5Y 4/1) shale. Bioturbation features (some pyritized), framboidal pyrite, & pyrite streaks occur throughout the interval. Slickensides occur at a depth of 3022.5' and at 3023.7'. A natural inclined fracture extends from 3022.9' to 3023.2'. Amber spores & carbonaceous material are present.
- 3028.8' - 3036.1' Shale, brownish black (5YR 2/1) interbedded and laminated with olive grey (5Y 4/1). Core interval contains pyritized burrows, framboidal pyrite, and carbonaceous material. Brachiopods occur at depths 3032.5, 3033.5 and at 3036.9. A natural fracture starts at 3029.7 and ends at 3030.0 and is not mineralized. Amber spores seem to disappear in this section.
- 3036.1' - 3043.6' Shale, olive grey (5Y 4/1) to greenish grey (3G 6/1) interbedded, laminated and streaked with brownish black (5YR 2/1) shale. Core interval contains pyrite streaks & pyritized burrows.
- 3043.6' - 3051.6' Shale (5G 6/1) greenish grey interbedded & laminated with (5YR 2/1) brownish black shale. A silty interval occurs from 3044.0' to 3044.3' (5Y 6/1). Bioturbation features, pyrite streaks, Lingula (3049.1'), a pyritized gastropod (3045.3') occur.
- 3051.6' - 3059.2' Shale (5G 6/1) greenish grey laminated & streaked with dark greenish gray (5GY 4/1) and brownish black (5YR 2/1) shale. A cephalopod operculum occurs at 3053.3'. The interval contains burrows, and framboidal pyrite.
- 3059.2' - 3067.7' Shale (5G 6/1) greenish grey with thin beds, laminations & streaks of olive black (5Y 2/1), laminations & streaks of dark greenish grey (5GY 4/1), and thin beds of (5Y 8/1) light olive grey silty shale. The interval is highly bioturbated. Pyrite streaks, amber spores, & Lingula (3061.9' and 3062.8') are present.

- 3067.7 - 3075.8 Shale, greenish gray (5G 6/1) interbedded, laminated, and streaked with olive black (5Y 2/1) and streaked with dark greenish gray (5G 4/1) shale. Core interval contains a large wood fragment at a depth of 3074.9 ft. The interval has bioturbation with many being pyritized burrows. Framboidal pyrite and pyrite streaks are also observed. Amber spores are present in darker sections.
- 3075.8 - 3083.6 Shale, greenish gray (5G 6/1) interbedded, laminated and streaked with olive black (5Y 2/1) and interbedded and streaked with dark greenish gray (5G 4/1) shale. Amber spores observed in olive black sections. The interval is bioturbated with many pyritized burrows and also has framboidal pyrite and pyrite streaks.
- 3083.6 - 3090.9 Shale, dark greenish gray (5GY 4/1) interbedded laminated and streaked with olive black (5Y 2/1) and greenish gray (5G 6/1) shale. Core interval is bioturbated with many pyritized burrows and also has pyrite streaks. Olive black sections have a few amber spores.
- 3090.9 - 3095.6 Shale, dark greenish gray (5GY 4/1) interbedded, laminated & streaked with brownish black (5YR 2/1) and interbedded and streaked with greenish gray (5G 6/1) shale. Core interval is bioturbated with pyritized burrows and contains some pyrite streaks. Fish scales are seen in a few sections and an unidentified fossil is seen at 3094.0'. A few amber spores are seen in the darker sections. Some carbonaceous material seen at depth of 3093.6 feet.
- 3095.6 - 3100.0 Shale greenish black (5G 4/1) graded into dark greenish gray (5G 4/1), some interbedded and laminations of brownish black (5YR 2/1) core interval has very little bioturbation. Core contains some pyrite streaks. Fish scales were present.
- 3100.0 - 3107.7 Shale, dark greenish gray (5G 4/1) interbedded, laminated and streaked with brownish black (5YR 2/1) and interbedded and streaked with greenish black (5G 2/1) and a laminated bioturbated section of grayish yellow (5Y 8/4) (Slightly silty). Core interval is bioturbated with many pyritized burrows, also contains framboidal pyrite and pyrite streaks.
- 3107.7 - 3115.3 Shale (5Y 2/1) olive black streaked laminated, and interbedded with (5YR 2/1) brownish black shale. Beds and streaks of (5G 4/1) dark greenish grey shale and (5GY 6/1) greenish grey silty shale also occur. A pyritized burrowed zone occurs at 3109.15'. The interval is high in pyrite content, with framboidal pyrite, pyritized spores, & pyritized burrows being common. Several feet are highly fractured due to coring and thus are unorientable.
- 3115.3 - 3123.0 Shale (5GY 4/1) dark greenish grey laminated, streaked, and interbedded with (5Y 2/1) olive black and (5YR 2/1) brownish black shale. Several burrows occur throughout the interval. Some (5GY 6/1) greenish grey silty streaks and laminations occur throughout. The interval is rich in pyritized spores, pyritized burrows, and framboidal pyrite. An occasional carbonaceous fragment and amber spore can be found in the darker (5YR 2/1) shales.
- 3123.0 - 3130.1 Shale (5G 4/1) dark greenish grey interbedded and laminated with (5Y 2/1) olive black and (5YR 2/1) brownish black shale. A facies of (5G 4/1) dark greenish grey shale occurs from 3129.3 to 3130.1. An excellent example of lenticular bedding can be observed at 3128.3'. The interval is high in pyrite

content with framboidal pyrite, pyritized spores, and pyritized burrows being common. A plant stem occurs at 3124.5'.

3130.1 - 3136.9 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. Pyrite occurs in the form of pyrite laminations, framboidal pyrite, pyritized spores, and pyritized burrows. The (5GY 4/1) shale is very friable due to water loss and unloading.

3136.9' - 3144.1 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. Pyrite is found in the forms of pyritized spores, pyritized burrows, framboidal pyrite, & pyritic laminations. An unidentifiable pelecypod is found at 3140.5'. At 3141.7' a film of carbonaceous material in the form of vitrains covers the entire bedding surface. Beginning at 3138.0', the interval becomes more silty; thus the core does not tend to be quite as friable giving larger core pieces. Amber spores can be seen occasionally in the brownish black shales.

3144.1' - 3151.8' Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 4/1) olive grey shale. The interval is a silty shale rich in pyrite in the forms of euhedral pyrite, framboidal pyrite, and occasionally as pyritized spores.

3151.8' - 3159.1' Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 4/1) olive grey shale. The interval is silty shale with several burrowed zones; some which are pyritized. Pyrite also occurs in the form of framboidal pyrite.

3159.1' - 3166.9' Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 4/1) olive grey shale. The interval contains silty streaks and pyrite streaks. Many burrows occur throughout the interval, with several being pyritized. Framboidal pyrite occurs throughout the interval.

3166.9 - 3174.3' Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 4/1) olive grey shale. The interval contains silty & pyritic streaks and contains several burrows some of which are pyritized. Framboidal pyrite is common throughout the entire interval. An occasional pyritized spore can be observed.

3174.3 - 3182.3' Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 4/1) olive grey shale. The interval contains silty and pyritic streaks. A conodont (platforms) was observed at 3177.4'. Several burrows occur throughout the interval with some being pyritized. Pyrite also occurs in the form of pyritized spores and framboidal pyrite. Amber spores occur occasionally with darker shales.

3182.3 - 3189.7' Shale (5GY 4/1) dark greenish grey streaked and laminated with (5Y 4/1) olive grey shale. A dolomitic lamination occurs at 3183.6'. The interval contains silty streaks, framboidal pyrite, pyritized spores, and pyritized burrows.

3189.7 - 3195.7 Shale (5GY 4/1) dark greenish grey streaked and laminated with (5Y 4/1) olive grey shale. Several bioturbated zones are evident in the lower portion of the interval. Pyritized spores and framboidal pyrite are also present.

- 3195.7 - 3203.4 Shale (5GY 4/1) dark greenish grey laminated and streaked with (5Y 2/1) olive black shale. The interval contains a few silty streaks giving it a higher relative hardness. Several conodonts were observed at 3197.2'. The interval is highly bioturbated with a few burrows being pyritized. Framboidal pyrite is common in the interval.
- 3203.4 - 3211.2 Shale (5GY 4/1) dark greenish grey streaked and laminated with (5Y 4/1) olive grey shale. The interval is highly bioturbated in the several burrows being pyritized. Framboidal pyrite, pyritized spores and carbonaceous material are also common in the interval.
- 3211.2 - 3217.9 Shale (5Y 2/1) olive black streaked, laminated, & interbedded with (5GY 4/1) dark greenish grey shale. The interval contains framboidal pyrite, pyritized burrows, pyritized spores, and carbonaceous material in the form of vitrain.
- 3217.9 - 3233.5 Shale (5GY 4/1) dark greenish grey interbedded and laminated with (5YR 2/1) brownish black shale. Several bioturbated zones at @ 3231' have been replaced by dolomite. The interval contains several burrows w/ many being pyritized. Framboidal pyrite and carbonaceous fragments are common throughout the interval.
- 3233.5 - 3241.6 Shale (5GY 4/1) dark greenish grey interbedded and laminated with (5Y 2/1) olive black shale. A natural inclined fracture extends from @ 3235' to 3237.8'. The interval is highly bioturbated with several burrows being dolomitic, while others may be pyritized. An occasional amber spore can be seen in the darker shale facies. A conodont was observed at 3236.4'.
- 3241.6 - 3248.2 Shale (5GY 4/1) dark greenish grey interbedded and laminated with (5Y 2/1) olive black shale. Several dolomitic bioturbated zones occur throughout the interval. A natural inclined fracture extends from 3241.6 to 3245.0. Another inclined fracture begins at 3247' and extends to the base of the interval. Carbonaceous and pyritized plant fragments and pyritized burrows are common throughout the interval.
- 3248.2 - 3257.9 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. Several dolomitic bioturbated zones occur throughout the interval. Pyritized plant stems, pyritized burrows, amber spores, carbonaceous fragments, and amber spores can be found in the interval. A natural inclined fracture extends from 3248.2' to 3252.7'. This is a continuation of the natural inclined fracture from the preceding interval. Another inclined fracture begins at 3257.3'.
- 3257.2 - 3265.5 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. A natural inclined fracture extends from 3257.2' to 3259.5'. This is a continuation of the natural fracture from the preceding interval. Several dolomitized bioturbated zones occur in the interval. Pyritized burrows, amber spores and carbonaceous material are common throughout the interval.
- 3265.5 - 3271.9 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. The interval contains pyritized burrows, pyritized or amber spores, & pyritized or carbonaceous plant fragments. Pyrite also occurs in the form of framboidal pyrite.

- 3271.9 - 3279.5 Shale (5GY 4/1) dark greenish grey interbedded, laminated, & streaked with (5Y 2/1) olive black shale. A silty zone (5GY 6/1) greenish grey occurs from 3275.6 to 3276.1. This silty zone contains a systarian nodule. Pyritized or amber spores, carbonaceous fragments, pyritized burrows, & framboidal pyrite occur throughout the interval.
- 3279.5 - 3287.1 Shale (5GY 4/1) dark greenish grey interbedded, alminated, & streaked w/ (5Y 2/1) olive black shale. A small septarian concretion occurs at 3281.6'. The interval contains pyritized burrows, pyritized or amber spores, brachiopod fragments, carbonaceous fragments and framboidal pyrite.
- 3287.1 - 3294.8 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. (5Y 2/1) olive black laminations & streaks occur throughout the interval. Several pyritized cephalopods occur at 3290.5' associated w/ a cephalopod aperculum. Pyritized burrows, pyritized or amber spores, carbonaceous fragments, and brachiopod fragments occur throughout the interval. What appears to be ostracodes, occur occasionally throughout the interval.
- 3294.9 - 3302.2 Shale (5GY 4/1) dark greenish grey interbedded with (5YR 2/1) brownish black shale. (5Y 2/1) olive black streaks and laminations occur occasionally throughout the interval. Several cephalopods, ostracodes, brachiopods, carbonaceous & pyritized plant fragments, pyritized or amber spores, & pyritized burrows occur throughout the interval.
- 3302.2 - 3309.1 Shale (5Y 2/1) olive black interbedded with (5YR 2/1) brownish black and (5GY 4/1) dark greenish grey shale. The interval contains pyritized burrows, pyritized plant fragments, pyritized or amber spores, conodonts, & brachiopod fragments.
- 3309.1 - 3314.1 Shale (5GY 4/1) dark greenish grey streaked and interbedded with (5Y 2/1) olive black shale. The interval contains pyrite streaks, framboidal pyrite, pyritized and amber spores, pyritized plant fragments, cephalopods, ostracodes, and brachiopods including Lingula.
- 3314.1 - 3321.2 Shale (5GY 4/1) dark greenish grey with (5Y 2/1) olive black streaks & laminations & thin beds of (5YR 2/1) brownish black shale. The interval contains pyrite & amber spores, carbonaceous plant stems, and framboidal pyrite.
- 3321.2 - 3329.2 Shale (5GY 4/1) dark greenish grey streaked w/ (5Y 2/1) olive black shale. Thin beds of (5YR 2/1) brownish black shale occur intermittently throughout the interval. A (5GY 2/1) greenish grey silty zone occurs from 3326.0 to 3326.7'. This silty zone contains a septarian concretions. Slickensides occur at 3326.7'; but appear to be a result of slumping of the silty zone above. The interval contains pyritized & amber spores, pyritized burrows, carbonaceous fragments & fishscale.
- 3329.2 - 3336.2 Shale (5Y 2/1) olive black laminated & interbedded with (5YR 2/1) brownish black shale. The interval contains pyritized and amber spores, framboidal pyrite, carbonaceous material, & pyritized burrows. A conodont was observed at 3333.1'.
- 3336.2 - 3343.4 Shale (5YR 2/1) brownish black interbedded & laminated w/ (5Y 2/1) olive black shale. The interval contains pyritized & amber spores, pyritized burrows, pyritized sponge spicules, Lingula & Orbiculorides, fish scales, & carbonaceous material. What appears to be a thermally altered aboral view of a platform conodont occurs at 3339.9'.

- 3343.4 - 3350.7 Shale (5YR 2/1) brownish black interbedded with (5Y 2/1) olive black shale. A silty facies occurs from 3345' to 3345.6'. This facies, a (5Y 6/1) light olive grey resulted in the slumping of the underlying shale from 3345.5' to 3346.6'. The interval contains conodonts, Lingula, fish scales, pyritized & amber spores, pyritized burrows, carbonaceous fragments, & framboidal pyrite.
- 3350.7 - 3359.4 Shale (5YR 2/1) brownish black interbedded with (5Y 2/1) olive black. An inclined fracture extends from @ 3357.4' to 3352.0'. A thin lamination of pyrite resulted in a coring induced bedding plan fracture at 3357.7'. The interval contains numerous fish scales, cephalopods, cephalopod operculums, brachiopods including Lingula, pyritized and amber spores, pyritized burrows, carbonaceous fragments, & framboidal pyrite.
- 3359.4 - 3367.0 Shale (5YR 2/1) brownish black laminated & interbedded with (5Y 2/1) olive black shale. Several pyrite streaks & laminations occur throughout the interval. The interval contains pyritized burrows, pyritized & amber spores, plant fragments, Lingula & Orbiculoidia, & fish scales.
- 3367.0 - 3373.5 Shale (5YR 2/1) brownish black laminated & interbedded with (5Y 2/1) olive black shale. The interval contains pyritized burrows, pyritized and amber spores, plant fragments, fish scales, brachiopods including Lingula, fish scales, & framboidal pyrite.
- 3373.5 - 3381.6 Shale (5YR 2/1) interbedded with (5Y 7/1) light grey siltstone and (5GY 6/1) greenish grey and (5Y 6/1) light olive grey silty shale. Several bioturbated zones occur throughout the interval. The siltstone zone from 3373.5' to 3374.1 contains a septarian concretion. A natural inclined fracture extends from 3379.1' to 3381.6'. Several fossiliferous zones occur in the interval. A calcareous lamination of brachiopods occurs at 3374.7'. A lamination of calcareous fossils occurs at 3375.2' and a zone of conodonts on a lamination of pyrite occurs at 3378.1'. Other fossils encountered included pyritized burrows and pyritized & amber spores.
- 3381.6 - 3390.1 Shale (5YR 2/1) brownish black, interbedded, alminated & streaked w/ (5Y 2/1) olive black shale. Several burrowed zones occur throughout the interval. The interval contains framboidal pyrite & pyritized & amber spores. The contact w/ the Onondaga Limestone is at 3392.0'.
- 3390.1 - 3391.35 Shale, brownish-black (5YR 3/1), slightly calcareous, with abundant orange Tasmanites on bedding planes, with pyrite-filled burrows.
- 3391.35 - 3391.8 Limestone, mottled dark-gray (N3) with swirls of medium-gray (N5), very fine crystalline, very argillaceous, with Tasmanites. Mottled appearance result of burrows.
- 3391.8 - 3392.4 Limestone, medium-gray (N5), very fine crystalline, argillaceous, with Tasmanites.
- 3392.4 - 3392.5 Interbedded laminae of limestone, medium-gray (N5), very fine crystalline, argillaceous and shale, black (N1). Laminae broken by burrows.
- 3392.5 - 3392.9 Limestone, medium-gray (N5), very fine crystalline, argillaceous.
- 3392.9 - 3393.11 Limestone, dark-gray (N3), coarsely crystalline, argillaceous, with abundant fossils, with disseminated pyrite. Fossils resemble a lay deposit.

3393.11 - 3393.21 Limestone, dark gray (N3), very fine crystalline, very argillaceous, with brachiopods.

3393.21 - 3399.4 Limestone, light-gray to medium-light gray (N7 to N6), fine to medium crystalline, fossiliferous, with layers of shale brownish-black (5YR 3/1) 3394.55 - 3394.62; 3395.08 - 3395.1; 3396.05 - 3396.08; and 3399.1 - 3399.15. Horizontal stylolite at 3397.25.

**PRELIMINARY
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